NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

INTEL CORPORATION,
Appellant

v.

QUALCOMM INCORPORATED,
Appellee

2022-1046, 2022-1047

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2018-01154, IPR2018-01240.

Decided: June 27, 2023

JAMES MURPHY DOWD, Wilmer Cutler Pickering Hale and Dorr LLP, Los Angeles, CA, argued for appellant. Also represented by DAVID LANGDON CAVANAUGH, THOMAS SAUNDERS, Washington, DC; JAMES M. LYONS, Boston, MA.

ISRAEL SASHA MAYERGOYZ, Jones Day, Chicago, IL, argued for appellee. Also represented by ROBERT BREETZ, DAVID B. COCHRAN, JOSEPH M. SAUER, Cleveland, OH; KELLY HOLT, New York, NY; JENNIFER L. SWIZE, Washington, DC.

Before HUGHES, STOLL, and STARK, *Circuit Judges*.

HUGHES, *Circuit Judge*.

Intel Corporation appeals two decisions of the Patent Trial and Appeal Board finding claims 10 and 15–20 of U.S. Patent No. 8,698,558 patentable. Because the Board properly construed "boosted supply voltage or the first supply voltage" to require a "selective boost" and because the Board's finding that Kwak does not anticipate is supported by substantial evidence, we affirm.

I

A

Mobile devices transmit our phone calls, text messages, and other data through radio frequency (RF) signals. To transmit data, RF signals need to travel between mobile devices and base stations in a wireless network. The further a signal must travel, the more power is required. To provide that extra power, mobile devices use a variety of power amplifiers to increase the power of the RF signal to a sufficient level. "A [power amplifier] typically receives its power in the form of a supply voltage from a power supply generator[.]" Appellant's Br. 4. The power amplifier will accept an input signal carrying data, and then produce an output signal that replicates the input signal, but with proportionally greater power.

There are several techniques available to boost the power supply that are relevant to this appeal. For example, envelope amplifiers can be used to track the RF input signal's upper bound and adjust how much power is supplied, but can be inefficient because it loses power due to heat dissipation. Similarly, switchers can also supply power at certain frequencies, but without dissipating voltage as heat. Hybrid supply generators combine features of envelope amplifiers and switchers to gain the advantages of both and can use one or the other depending on the RF

signal. And finally, when a device's battery is too low, boost converters can be used to boost the battery voltage to a higher voltage.

B

Qualcomm Corporation owns the '558 patent, titled "Low-Voltage Power-Efficient Envelope Tracker," which describes various techniques for managing the power supply necessary to transmit RF signals, while also extending battery life. The '558 patent describes two improvements to hybrid supply generators: (1) adding an offset current to a switcher, which senses an input current and generates a switching signal to charge and discharge an inductor that provides a supply current; and (2) connecting a boost converter to an envelope amplifier, which selectively operates by using a supply voltage or a boosted voltage. '558 patent at 1:34–54, 1:61–2:2. An annotated version of Figure 5 of the '558 patent shows these elements, with the boost converter in blue, envelope amplifier in purple, switcher in yellow, and the offset current in pink:

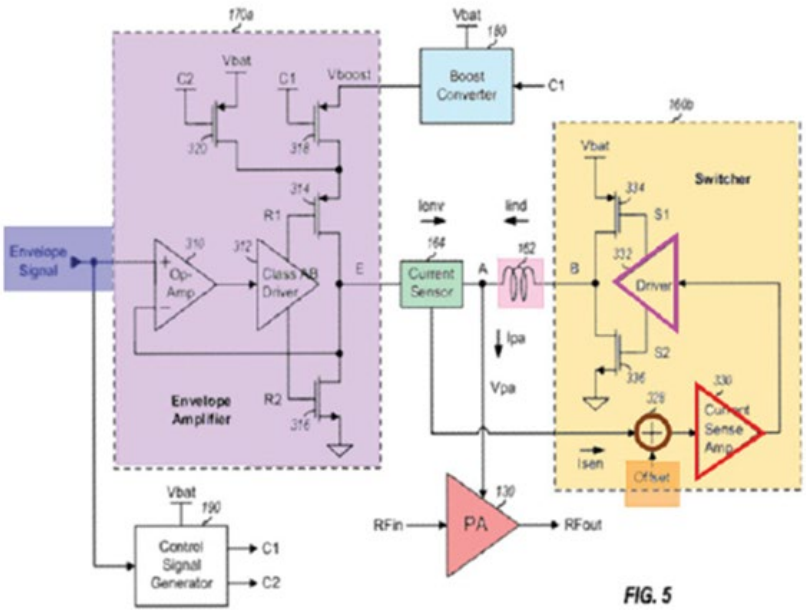

FIG. 5

'558 patent at Fig. 5 (coloring added by parties). Claims 10 and 15 are representative of the claims at issue in this appeal:

> Claim 10:
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> An apparatus for generating supply voltages, comprising:
>
> means for generating a boosted supply voltage based on a first supply voltage, the boosted supply voltage having a higher voltage than the first supply voltage; and
>
> means for generating a second supply voltage based on the envelope signal and the boosted supply voltage, wherein the means for generating the second supply voltage incorporates an envelope amplifier that produces the second supply voltage using an operational amplifier (op-amp) that receives the envelope signal and provides an amplified signal, a driver that receives the amplified signal and provides a first control signal and a second control signal, a P-channel metal oxide semiconductor (PMOS) transistor that receives the first control signal, *a source that receives the boosted supply voltage or the first supply voltage*, and a drain providing the second supply voltage and an N-channel metal oxide semiconductor (NMOS) transistor that receives the second control signal at a gate and provides a second supply voltage through a drain, and a source for circuit grounding.

'558 patent at 12:25–45 (emphasis added).

> Claim 15:
>
> An apparatus comprising:

an inductor operative to receive a switching signal and provide a supply current; and

a switcher operative to sense an input current and generate the switching signal to charge and discharge the inductor to provide the supply current, the switcher adding an offset to the input current to generate a larger supply current via the inductor than without the offset, wherein the switcher comprises

a summer operative to sum the input current and an offset current and provide a summed current,

a current sense amplifier operative to receive the summed current and provide a sensed signal, and

a driver operative to receive the sensed signal and provide at least one control signal used to generate the switching signal for the inductor.

'558 patent at 13:19–34.

C

In June 2018, Intel filed two petitions for inter partes review, collectively challenging claims 10–11 and 15–20 of the '558 patent.[1] In one petition, Intel alleged that (1) claims 15, 17, 18, and 20 are anticipated by Kwak[2]; (2)

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[1] As these petitions were filed prior to November 13, 2018, the claims are given their "broadest reasonable construction." 37 C.F.R. § 42.100(b) (2016); *Personalized Media Commc'ns, LLC v. Apple Inc.*, 952 F.3d 1336, 1340 & n.2 (Fed. Cir. 2020).

[2] T.W. Kwak, et al., *A 2 W CMOS Hybrid Switching Amplitude Modulator for EDGE Polar Transmitters*, IEEE

claim 16 is obvious in view of Kwak; and (3) claim 19 is obvious in view of Kwak combined with Choi[3]. Intel alleged that Kwak disclosed the claimed "switcher operative to sense an input current and generate the switching signal to charge and discharge the inductor to provide the supply current, the switcher adding an offset to the input current to generate a larger supply current via the inductor than without the offset," relying specifically on Figures 5 and 6. J.A. 4049-56.

In the other petition, Intel alleged that (1) claim 10 is obvious in view of Chu[4] combined with Choi and

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J. SOLID-STATE CIRCUITS 2666–76 (2007). Kwak discloses a type of hybrid supply generator, called a "hybrid switching amplifier," that includes a linear amplifier and a switching amplifier. J.A. 14. Figures 5 and 6 are relevant to this appeal. The Board found that Figure 5 of Kwak disclosed a "hybrid supply generator with a feedforward path so the input signal can directly control the switching amplifier." J.A. 14. The Board further found that Figure 6 "depicts the detailed circuit of the hybrid switching amplifier [with] a different summing circuit . . . and integrator . . . than the one depicted in Figure 5 . . . . " J.A. 17.

[3] Jinsung Choi, et al., *Envelope Tracking Power Amplifier Robust to Battery Depletion*, Microwave Symposium Digest (MTT), 2010 IEEE MTT-S INTERNATIONAL 1074–77 (2010). Choi discloses "[a] wideband envelope tracking power amplifier" with an integrated boost converter to keep a stable operation of the power amp supply modulator. J.A. 28.

[4] Wing-Yee Chu, et al., *A 10 MHz Bandwidth, 2 mV Ripple PA Regulator for CDMA Transmitters*, IEEE J. SOLID-STATE CIRCUITS 2809–19 (2008).

Hanington[5]; and (2) claim 11 is obvious in view of Chu combined with Choi, Hanington, and Myers[6]. Intel alleged that the boost converter disclosed in Choi, when combined with the transistor disclosed in Chu, "receiv[es] the boosted supply voltage," as claimed in claim 10, J.A. 5076, and that it would have been obvious to modify the envelope amplifier disclosed in Chu to operate selectively with either a battery supply or boosted voltage.

The Board instituted review on all grounds in Intel's petitions. But the Board found all claims, other than claim 11, patentable.

First, the Board construed "a source that receives the boosted supply voltage or the first supply voltage" in claim 10 (and the corresponding phrase in claim 19) to require that "the envelope amplifier be capable of operating, selectively, based on the first supply voltage or the boosted supply voltage." J.A. 12, 45. In other words, the Board construed the phrase to require both voltage options to be available, and for the envelope amplifier to be able to switch between the first supply voltage and the boosted supply voltage, as needed—a feature referred to as "selective boost" in the final written decisions. Based on this construction, the Board found that the combination of Kwak and Choi did not render claims 10 or 19 unpatentable, because the references only disclosed an envelope amplifier that receives a boosted supply voltage. Thus, the envelope amplifier could not perform the required selective boost.

Second, the Board found that Kwak did not anticipate claims 15, 17, 18, or 20 because, while Kwak disclosed each

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[5] Gary Hanington, et al., *High-Efficiency Power Amplifier Using Dynamic Power-Supply Voltage for CDMA Applications*, IEEE TRANSACTIONS ON MICROWAVE THEORY & TECHNIQUES 47:8 (1999).

[6] U.S. Patent No. 5,929,702.

of the limitations of claims 15, 17, 18, and 20 across Figures 5 and 6 of the reference, it did not do so "in an embodiment as arranged in the claims." J.A. 20. Relying on our precedent in *Microsoft Corp. v. Biscotti, Inc.*, 878 F.3d 1052, 1068–69 (Fed. Cir. 2017), the Board found that Intel had failed to establish that a person of skill in the art would "at once envisage" the claimed arrangement or combination of elements. And while the Board at first found that Kwak rendered claim 16 obvious based on the disclosures in Figures 5 and 6, the Board reversed course after Qualcomm requested rehearing, finding that Intel's obviousness argument incorporated its anticipation argument for claim 15, and that Intel did not provide a motivation to combine the different embodiments of Kwak.

Intel now appeals.

II

Claim construction is a legal issue we review de novo, based on underlying factual findings that are reviewed for substantial evidence. *Perfect Surgical Techs., Inc. v. Olympus Am., Inc.*, 841 F.3d 1004, 1012 (Fed. Cir. 2016). Anticipation is a question of fact that we review for substantial evidence. *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015).

III

On appeal, Intel challenges two aspects of the Board's decision. First, Intel argues that the Board erred in construing "a source that receives the boosted supply voltage or the first supply voltage" to require a selective boost, and that the Board should have applied the ordinary meaning of "or." Second, Intel argues that the Board erred in finding that Kwak does not disclose a single embodiment in Figures 5 and 6, and that alternatively, the Board failed to consider that the functionalities of Figures 5 and 6 could be combined. We address each argument in turn.

A

Intel argues that the Board erred in reading a "selective boost" limitation into claims 10 and 19. Intel relies on our past constructions of claims containing "or," in arguing that "or" describes a series of alternatives, so that when a claim recites "A" or "B," prior art disclosing either "A" or "B" satisfies the claim. *Brown v. 3M*, 265 F.3d 1349, 1352 (Fed. Cir. 2001); *see SkinMedica, Inc. v. Histogen Inc.*, 727 F.3d 1187, 1199 (Fed. Cir. 2013); *Game & Tech. Co. v. Activision Blizzard Inc.*, 926 F.3d 1370, 1378 (Fed. Cir. 2019). Intel argues that the Board improperly "narrow[ed] the claims to require that the envelope amplifier be able to receive both a first supply voltage ***and*** the boosted supply voltage and select between them," thereby reading a "selective boost" limitation into the claim language. Appellant's Br. 34 (emphasis in original). Under what Intel considers to be the "correct" construction, the combinations involving Kwak and Choi—which undisputedly disclose a boosted supply voltage—would render claims 10 and 19 obvious.

We disagree. Intel's argument only considers "or" in isolation but does not consider the context in which "boosted supply voltage or the first supply voltage" is used. "Proper claim construction . . . demands interpretation of the entire claim in context, not a single element in isolation." *Hockerson-Halberstadt, Inc. v. Converse Inc.*, 183 F.3d 1369, 1374 (Fed. Cir. 1999). While "or" *can* refer to alternatives, that is not a hard-and-fast rule. Here, the Board properly analyzed the phrase in context, and determined that the claimed invention required an envelope amplifier to receive both a boosted supply voltage and a first supply voltage and select between the two. Specifically, the Board considered the '558 patent's specification and its earlier IPRs addressing claims 6, 8, and 13 to determine that "the amplifier must be able to receive both the boosted supply voltage and the first supply voltage (a selective boost) as recited in the claims." J.A. 10, 12. For example, the Board relied on the following passage from the '558 patent:

> [T]he envelope amplifier may further receive the first supply voltage and may generate the second supply voltage based on either the first supply voltage or the boosted supply voltage. For example, the envelope amplifier may generate the second supply voltage (i) based on the boosted supply voltage if the envelope signal exceeds a first threshold and/or if the first supply voltage is below a second threshold or (ii) based on the first supply voltage otherwise.

'558 patent at 1:42–50.

We agree with the Board's analysis and come to the same conclusion based on the claim construction evidence provided.[7] Thus, we affirm the Board's construction of "boosted supply voltage or the first supply voltage" and the corresponding phrases in claims 10 and 19.

B

Next, Intel argues that the Board erred in finding that Kwak does not anticipate claims 15, 17, 18, or 20. Intel first argues that the Board's determination that Figures 5 and 6 of Kwak are multiple embodiments is not supported by substantial evidence, and that instead the Board should have treated those figures as a single embodiment because the caption of Figure 6 describes a "[d]etailed block diagram of ***the*** hybrid switching amplifier." Appellant's Br. 44 (emphasis added). Intel alternatively argues that, if Figures 5 and 6 disclosed different embodiments, the Board erred by requiring all claim elements to be found in one single embodiment in the reference, without considering

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[7] This construction is also consistent with how the Board construed corresponding phrases in claims 6, 8, and 13. *See Qualcomm Inc. v. Intel Corp.*, No. 2020-1587, 2021 WL 4772765, at *1 (Fed. Cir. Oct. 13, 2021).

whether a person having ordinary skill in the art would combine the embodiments as arranged in the claims.

We disagree with Intel's first argument and need not consider the second. Before the Board, Intel only advanced its theory that Figures 5 and 6 of Kwak disclosed a single embodiment, but never advanced a theory that Figures 5 and 6 were separate embodiments that a person having ordinary skill in the art would combine. The Board considered Kwak's disclosures and expert testimony to conclude that Figure 6 was not merely a "more detailed" implementation of Figure 5 but was a separate and different embodiment. J.A. 19. The Board noted that Figure 6 of Kwak disclosed "a summing circuit operating on input current and offset current that differs from the voltage circuit signals shown in Figure 5" and that the "feedforward node in Figure 6 differs from that shown in Figure 5." J.A. 19. The Board also noted that Intel's expert testimony did not address the differences between Figures 5 and 6 and relied instead on testimony from Qualcomm's expert that the two figures disclosed separate embodiments. This constitutes substantial evidence supporting the Board's determination that Figures 5 and 6 were not a single embodiment, and we will not disturb this determination on appeal.

Furthermore, we will not consider Intel's argument about whether Figures 5 and 6, as separate embodiments, could still anticipate the challenged claims because Intel did not raise that argument before the Board. Throughout the proceedings before the Board, Intel only advanced a position that Figures 5 and 6 were a *single* embodiment, rather than *distinct* embodiments that a person having ordinary skill in the art could still combine as arranged in the claims. Intel has described no exceptional circumstances excusing its failure to raise this argument before the Board and has therefore forfeited that argument. *In re Google Tech. Holdings LLC*, 980 F.3d 858, 863 (Fed. Cir. 2020) ("[A] position not presented in the tribunal under review will not be considered on appeal in the absence of

exceptional circumstances."). Accordingly, we affirm the Board's finding that Kwak does not anticipate claims 15, 17, 18, or 20.

IV

We have considered Intel's remaining arguments and find them unpersuasive. Therefore, we affirm the Board's final determination finding claims 10 and 15–20 patentable.

AFFIRMED